Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	**)**	
	)	
Expanding Flexible Use of the 3.7 to 4.2 GHz Band	**)**	**GN Docket No. 18-122**
	)	
Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz	**)**	**GN Docket No. 17-183**

COMMENTS OF ROBERT BOSCH LLC AND SUPPORTING PARTIES

Robert Bosch LLC (Bosch), a manufacturer of various high-quality electronic products,[1] by counsel, for itself and on behalf of the Supporting Parties noted herein[2] and pursuant to Section 1.415 of the Commission's Rules (47 C.F.R. § 1.415), hereby respectfully submits these comments in response to the *Notice of Proposed Rule Making*, FCC 18-91, released July 13, 2018 in the captioned docket proceedings (the Notice).[3] The Notice seeks comment on various proposals for transitioning all or part of the 3.7-4.2 GHz band for flexible use, terrestrial mobile applications, and explores options for more efficient and intensive fixed use of the same band, all while protecting incumbent C-Band satellite earth stations from harmful interference. In the

[1] Bosch manufactures many different types of products for different industries, including vehicular electronic systems, industrial and consumer products, commercial construction products and tools, worldwide.

[2] Bosch is authorized to note that the following companies, each of which is engaged in manufacturing activities in the United States, support the position enunciated herein, and each is a signatory hereon: Beckhoff Automation LLC; ESR Pollmeier GmbH; Belden, Inc.; Sennheiser Electronic Corporation; and Mercedes-Benz US International. The supporting parties are collectively referred to herein as "the Supporting Parties."

[3] The Notice was published in the Federal Register on August 29, 2018, which established a comment date of October 29, 2018. 83 Fed. Reg. 44128 et seq. Therefore these comments are timely filed.

interest of ensuring sufficient spectrum for private local networks to facilitate innovations in industrial manufacturing systems, Bosch and the Supporting Parties state as follows:

1. Bosch and the Supporting Parties are proponents of compatible, flexible use of the 3.7-4.2 GHz band. The *Notice* accurately states the urgency of making adequate provision for 5G allocations. 5G implementation worldwide is proceeding at a rapid pace. One of the many reasons for this is the benefit of 5G technology immediately available in numerous industry sectors (referred to as "5G verticals")[4] including connected driving and in manufacturing. In the manufacturing sectors, the success of "Industry 4.0"[5] is dependent on availability of 5G technology and adequate mid-band spectrum therefor. Fundamental to the "fourth industrial revolution" is the implementation of a reliable communication layer capable of dealing with an increase of several orders of magnitude the number of assets, volume, variety of information and reaction times in future manufacturing systems.

2. Manufacturing initiatives and near-term research and development of Bosch and the Supporting Parties are largely dependent on the availability of worldwide, harmonized 5G allocations and harmonized spectrum availability for private local networks[6] used in manufacturing. It is notable in the context of this proceeding that the European Commission (EU Commission) has identified the band 3.4-3.8 GHz as a pioneer band for 5G networks in Europe. The allocation status of this band is currently under intensive discussion in Europe. Therefore,

[4] A vertical market is a market in which goods and services are provided that are specific to an industry, trade, profession, or other group of customers with specialized needs. 5G is being integrated into industrial communications to contribute towards global digital transformation, and the leading adopters are vertical sectors such as transportation, media, and manufacturing.

[5] Industry 4.0, oversimply defined, is the digital transformation of industrial markets with smart manufacturing currently on the forefront. Also referred to as the "fourth industrial revolution" in discrete and process manufacturing, logistics and supply chain, the chemical industry, energy, intelligent transportation, utilities, oil and gas, mining and metals and other segments, resources industries, healthcare, pharmaceuticals and even smart cities.

[6] These private local networks could be configured in the United States as unlicensed but registered systems, in order to provide the assurance of reliability in limited geographic areas. Or, as in Europe, they could be subject to limited-area individual licensing on a local basis for the same reason. Manufacturing outages due to electromagnetic compatibility issues are to be avoided and some limited exclusivity might be required in individual cases.

Bosch and the Supporting Parties endorse the Commission's proposal to make the 3.7-4.2 GHz band available for flexible use, including manufacturing, in the United States. This would permit at least partial harmonization in the mid-band 5G rollout as between Europe and the United States.[7]

3. This partial harmonization of the mid-band 5G allocation in the United States - relative to the configuration under discussion in Europe - would facilitate an exceptionally flexible opportunity for manufacturing in both the United States and Europe within the band segment available in common to both: 3.7-3.8 GHz.[8] The German Federal Network Agency (Bundesnetzagentur) has proposed an innovative means of flexibly rolling out mid-band 5G spectrum in Germany. Under that proposal, the band 3.4-3.7 GHz would be allocated and assigned by auction to traditional mobile broadband providers. The 3.7-3.8 GHz segment, however, would be flexibly deployed locally by individual manufacturing and industrial entities. The local deployment by the private sector would be a key component to the rollout of 5G in support of Industry 4.0 initiatives in manufacturing and industrial applications. As is the case with today's Wi-Fi hotspots, the manufacturing industry *must be able to manage its own individual 5G local networks* without those networks being under the control of commercial mobile broadband service providers. This is true for many reasons, not the least of which are liability issues and intellectual property protection and security. It is critical for 5G technology to be available to the entity involved in production and integrated locally in support of new and

[7] While not under consideration in this proceeding, Bosch would also strongly support a high-band/millimeter-wave allocation domestically in the 24.25-27.5 GHz band for 5G. The EU Commission has identified this band as well as a candidate band for 5G in Europe. As the Commission has noted in this proceeding, it is urgent to make available spectrum in both the low band below 4 GHz; the mid-band, and the millimeter-wave bands for 5G rollout.

[8] Should it be determined that precise harmonization is not feasible, the rollout in the United States of private 5G local networks in, for example, 3.8-3.9 GHz could be accommodated and would constitute a great step forward in facilitating the incorporation of 5G in the manufacturing industry and the full implementation of Industry 4.0.

future manufacturing and industrial applications. Only in this way will the opportunities for 5G Verticals and Industry 4.0 be realized.

4. It is understood that the Commission has proposed in the *Notice* to work upward from 3.7 GHz toward 4.2 GHz in the deployment of 5G in this Band. That plan is entirely consistent with the proposed availability of 3.7-3.8 GHz for private 5G local networks for industrial applications, and it would provide ample opportunities for allocation and auction of the segment 3.8-4.2 GHz in the United States to mobile broadband service providers and nationwide commercial mobile networks at an appropriate time. Bosch and the Supporting Parties suggest that the configuration proposed herein enables efficient frequency re-use; protects incumbents; and constitutes a tremendously effective use of spectrum across vertical markets. The flexible access of individual companies to the 3.7-3.8 GHz band provides a path to success for numerous industry sectors engaged in industrial manufacturing, chemical and pharmaceutical manufacturing, energy generation, healthcare, smart transportation systems, and news and entertainment program production, especially relative to special events, among many other applications.

5. Authorizing 3.7-3.8 GHz for private 5G local networks is also consistent with the Commission's stated intention to protect the many thousands of incumbent C-band downlink Earth stations in the 3.7-4.2 GHz band used by the broadcast industry for important program distribution on an ongoing basis. Given the local deployments of the private 5G networks; the low power levels relative to 5G macro base stations; the typical geographic separation between industrial manufacturing facilities and broadcast studios; and taking into account the possibility of unlicensed but registered or limited licensing of private 5G local networks for manufacturing (and as well the small portion of the overall 3.7-4.2 GHz band at issue), the private 5G local

networks would provide a compatible partial overlay on spectrum heavily used for C-band satellite downlinks. By contrast, the commercial mobile broadband service providers who would deploy 5G commercial networks in the band segment 3.8-4.2 GHz in the United States would be in a position to either pay for relocation of incumbent C-band downlinks to another band in order to permit rollout in the 3.8-4.2 GHz band, or to accept whatever geographic separation requirements are ultimately deemed necessary to protect incumbents who register their existing receive-only earth stations prior to the close of the C-band filing window, against interference from commercial 5G network overlays.

6. For all of the above reasons, Bosch and the Supporting Parties are of the view that the authorization of private 5G local networks in the band segment 3.7-3.8 GHz is an urgent component to the Commission's proper focus on timely rollout of 5G mobile and fixed operation in the 3.7-4.2 GHz band. The availability of these private local networks constitutes a highly flexible and preferential means of allocation of radio service throughout the United States pursuant to the Commission's statutory obligation in that respect. 47 U.S.C. § 307(b). Nor is the idea of private 5G local networks in support of the fourth industrial revolution in manufacturing a "blue sky" concept. It is currently being implemented in Germany and considered throughout Europe. Bosch would be pleased to provide a full briefing to the Commission on the specifics of Industry 4.0 and the German model of private 5G local networks. The success of Industry 4.0 is dependent on the integration of 5G technology at the local level. It promises a great leap forward in industrial efficiency and output with unlimited future potential.

Therefore, the foregoing considered, Robert Bosch LLC and the Supporting Parties do

hereby respectfully request that the Commission make 5G technology available on a flexible basis in the band 3.7-3.8 GHz for use in industrial applications as proposed herein.

Respectfully submitted,

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